

## Appendix C. Maximum Permissible Exposure

# 1. Maximum Permissible Exposure

## 1.1. Applicable Standard

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.25 m normally can be maintained between the user and the device.

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm <sup>2</sup> )	Averaging Time  E  <sup>2</sup> ,  H  <sup>2</sup> or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm <sup>2</sup> )	Averaging Time  E  <sup>2</sup> ,  H  <sup>2</sup> or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

Note: f = frequency in MHz ; \*Plane-wave equivalent power density

## 1.2. MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

**E** = Electric field (V/m)

**P** = Peak RF output power (W)

**G** = EUT Antenna numeric gain (numeric)

**d** = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.

### 1.3. Calculated Result and Limit

<For WLAN Function>:

Antenna Type : Dipole Antenna

Max Conducted Power for IEEE 802.11b: 11.15 dBm

Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power ( mW )	Power Density (S) (mW/cm <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )	Test Result
5.00	3.1623	11.1500	13.0317	0.008203	1	Complies

<For GSM 850 Function>

3G USB Dongle 1 (Mode 1), FCC ID: QISE1612

Antenna Type : Fixed Internal Antenna

Frequency (MHz)	ERP power(dBm)	EIRP(dBm)	EIRP(mW)	Power Density (S) (mW/cm <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )	Test Result
824.2	30.7300	32.8700	1936.4220	0.385434	0.549	Complies
836.4	30.7800	32.9200	1958.8447	0.389897	0.549	Complies
848.8	30.9400	33.0800	2032.3570	0.404530	0.549	Complies

**CONCLUSION:**

Both of the WLAN and GSM 850 can transmit simultaneously, the formula of calculated the MPE is:

$$CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$$

**CPD = Calculation power density**

**LPD = Limit of power density**

Therefore, the worst-case situation is  $0.008203 / 1 + 0.404530 / 0.549 = 0.745052$ , which is less than "1".

This confirmed that the device comply with FCC 1.1310 MPE limit.

<For GSM 850 Function>

3G USB Dongle 2 (Mode 2), FCC ID: QISE169

Antenna Type : Fixed Internal Antenna

Frequency (MHz)	ERP power(dBm)	EIRP(dBm)	EIRP(mW)	Power Density (S) (mW/cm <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )	Test Result
824.2	31.7800	33.9200	2466.0393	0.490852	0.549	Complies
836.4	31.7500	33.8900	2449.0632	0.487473	0.549	Complies
848.8	31.7300	33.8700	2437.8108	0.485233	0.549	Complies

**CONCLUSION:**

Both of the WLAN and GSM 850 can transmit simultaneously, the formula of calculated the MPE is:

$$CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$$

CPD = Calculation power density

LPD = Limit of power density

Therefore, the worst-case situation is  $0.008203 / 1 + 0.490852 / 0.549 = 0.902287$ , which is less than "1".

This confirmed that the device comply with FCC 1.1310 MPE limit.

<For GSM 1900 Function>

3G USB Dongle 3 (Mode 3), FCC ID: QISE220X

Antenna Type : Fixed Internal Antenna

Frequency (MHz)	ERP power(dBm)	EIRP(dBm)	EIRP(mW)	Power Density (S) (mW/cm <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )	Test Result
1850.2	28.9000	31.0400	1270.5741	0.252901	1	Complies
1880	28.8700	31.0100	1261.8275	0.251160	1	Complies
1909.8	28.4600	30.6000	1148.1536	0.228534	1	Complies

**CONCLUSION:**

Both of the WLAN and GSM 1900 can transmit simultaneously, the formula of calculated the MPE is:

$$CPD1 / LPD1 + CPD2 / LPD2 + .....etc. < 1$$

CPD = Calculation power density

LPD = Limit of power density

Therefore, the worst-case situation is  $0.008203 / 1 + 0.252901 / 1 = 0.261105$ , which is less than "1". This confirmed that the device comply with FCC 1.1310 MPE limit.